



**STATHMORE INSTITUTE OF MANAGEMENT AND TECHNOLOGY**

**END OF SEMESTER EXAMINATION**

**DIR,DJNM,DE,DPR 1106: BUSINESS MATHEMATICS**

**DATE:20<sup>th</sup> AUGUST, 2018**

**TIME: 2 Hours**

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**INSTRUCTIONS:**

1. This examination consists of **FIVE** questions.
2. Answer question **ONE COMPULSORY** and **ANY** other **TWO** questions
3. Show all your workings clearly in the answer sheet

**Question 1 (compulsory) 30marks**

- a. Solve the following equation using factorization method; **[3 marks]**

$$x^4 + 4x^2 - 5 = 0$$

- b. Define the following terms as used in Business mathematics;

(i) Equivalent sets **[1 mark]**

(ii) Sequence **[1 mark]**

- c. Distinguish between the following as used in statistics **[4 marks]**

i. Statistic and Parameter.

ii. Qualitative and Quantitative data.

- d. A clothes dealer sold 3 shirts and 2 trousers for Kshs. 840 and 4 shirts and 5 trousers for Kshs 1680.

Form a matrix equation to represent the above information. Hence use Cramer's rule to find the cost of 1 shirt and the cost of 1 trouser. **[5 marks]**

- e. The mean of 200 observations was 50. Later on, it was discovered that two observations were wrongly read as 92 and 8 instead of 192 and 88. Find out the correct mean. **[3 marks]**

- f. Given sets  $A = \{2,3,4,5,6,7\}$ ,  $B = \{3,4,6,7,9,10\}$  and  $C = \{2,4,5,6,11,12\}$  find
- $A \cap B \cap C$  [1 mark]
  - $B \cup C$  [1 mark]
  - Represent the sets in a venn diagram [2 marks]
- g. Two matrices A and B are such that  $A = \begin{pmatrix} k & 4 \\ 3 & 2 \end{pmatrix}$  and  $B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$  Given that the determinant of  $AB = 4$ , find the value of k. [4 marks]
- h. Express the following as single logarithm; [2 marks]
- $$\log_3 5 \square 2 \square \log_3 8$$
- i. The following data relate to room charges at a local beach resort.

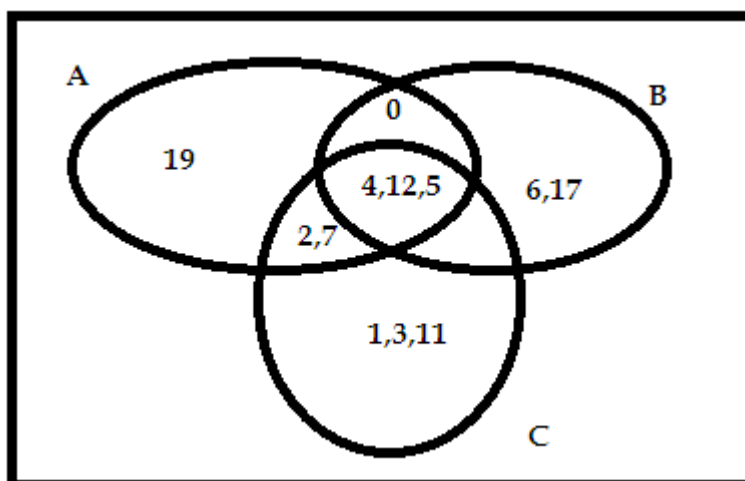
| Rate(USD)   | 1100 – 1200 | 1200 – 1300 | 1300 - 1400 | 1400 - 1500 | 1500 – 1600 |
|-------------|-------------|-------------|-------------|-------------|-------------|
| No of rooms | 5           | 9           | 14          | 15          | K           |

If the modal rate is 1410, find the number of rooms (k) for the rates ranging 1500 – 1600

[3 marks]

## Question 2 (Optional) 15marks

- Determine the power set of set  $X = \{4,10,12\}$  [2 marks]
- state the number of subsets in the power set of set A where  $n(A) = 25$  [1 mark]
- A sample survey carried out on the electronic devices used by different students in a class indicated the following; 70 students used Android phones, 60 students used Tablets, and 50 students used Laptops. 17 students used both Android phones and Tablets, 15 used Tablets and Laptops, 16 used both Laptops and Android phones, while 3 students used all the three devices. Use a Venn diagram to determine the total number of students in the sample. [5 marks]
- Study the following Venn diagrams and attempt the questions that follow;



List the members of;

i.  $(A \cap B)^c$  [1 mark]

ii.  $(A \cup C) \cap B^c$  [1 mark]

iii.  $(B \cap C) \cap A^c$  [1 mark]

e. Distinguish the following regions by shading on a Venn diagram. [4 marks]

i.  $(P \cup Q) \cap R'$

ii.  $(P \cup Q)' \cap R$

### Question 3 (Optional) 15marks

a. Define the following terms. [4 marks]

i. Null matrix

ii. Identity matrix

iii. Diagonal matrix

iv. Square matrix

b. Find the  $A^{-1}$  if  $A = \begin{pmatrix} 5 & -6 \\ 3 & 2 \end{pmatrix}$  [2 marks]

c. Evaluate;  $\begin{bmatrix} 2 & 1 \\ 7 & 5 \end{bmatrix} \begin{bmatrix} 1 & -2 \\ 2 & 1 \end{bmatrix} + \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$  [3 marks]

d. Apply Cramers' rule to solve the system;  $\begin{matrix} 3x + 5y = 12 \\ x - 2y = -7 \end{matrix}$  [4 marks]

e. Given that matrix  $A = \begin{bmatrix} 3 & 3 \\ 1 & x \end{bmatrix}$  is singular, find the value of  $x$  [2 marks]

### Question 4 (Optional) 15marks

a. Simplify completely [3 marks]

$$\frac{3x^2 - 1}{x^2 - 1} - \frac{2x + 1}{x + 1}$$

b. A boy did three-eighths of work on Monday. On Tuesday, he completes three-quarters of what remained on Monday. If on Wednesday, seven-eighths of what remained is done, what fraction of work remains undone? [3 marks]

c. Simplify the expression  $\left(a + \frac{1}{b}\right)^2 - \left(a - \frac{1}{b}\right)^2$  [3 marks]

- d. Grandchildren in a certain family decided to buy a gift for their grandmother worth Kshs 3000 by contributing equal amounts of money. Ten of them pulled out before contributing and each of the remaining grandchildren had to raise Kshs 10 more. Find the original number of the grandchildren. **[6 marks]**

**Question 5 (Optional ) 15marks**

- a. Briefly describe 3 methods of data representation in statistics **[3 marks]**
- b. State four properties of a good measure of average. **[2 marks]**
- c. The sales of four commodities A, B, C and D were in the ratio 1:2:3:4 respectively and were represented by a pie – chart. Calculate the angle of the sector representing the sale of A. **[2 marks]**

- d. The data below shows the times in minutes taken by 160 tourists to climb Mt. Kenya from the same point.

| Time     | 20 – 29 | 30 – 39 | 40 – 49 | 50 – 59 | 60 – 69 | 70 – 79 | 80 – 89 | 90 – 99 | 100 – 109 |
|----------|---------|---------|---------|---------|---------|---------|---------|---------|-----------|
| Tourists | 20      | 30      | 15      | 7       | $h$     | 10      | 14      | 19      | $u$       |

If the mean time was 65.5 minutes, calculate the values of  $h$  and  $u$ .

**[8 marks]**